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WINDBREAKS FOR ILLINOIS

Keep some DOLLARS at home with a WINDBREAK

Illinois is blessed with millions of acres of relatively flat land. The majority of this flat land was virtually treeless prairie when Illinois was settled by white man. The remainder was covered by forests. The cold winter winds had blown across the prairie virtually unimpeded for thousands of years. In the forested areas, trees slowed the winds thus modifying the climate.

The first settlers that came to Illinois settled in the forested areas because their farming tools could not handle the tough grass sod in the prairies. Hundreds of thousands of acres were cleared of trees so the settlers could farm. The pace of clearing slowed somewhat with the invention of the steel moldboard plow by John Deere in the late 1830's, which made it possible for farmers to plow the tough prairie sod. After WWII, when landowners started to use bulldozers on their farms, the pace of clearing trees from land increased. Economics accelerated the pace of land clearing even more during the late 1960's and through the 1970's. The removal of woodlands from the relatively level land allowed the cold winter winds to blow unimpeded over areas where the climate was once modified by trees.

Energy for heating buildings and snow removal was plentiful and relatively cheap from the end of WWII until the early 1970's.

In the early 1970's the price of energy for heating buildings began to rise. Presently during the early 1980's, some rural home owners are paying well over $1,000 per heating season for heating their homes. This of course depends on the type of fuel being used, construction and size of the home, location in the state, and existing protection from the cold winds.

Three winters of heavy snows and blizzards during the late 1970's reminded many rural residents in Illinois of the problems and costs associated with

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drifting snow. Roads, highways (including interstates), farm lanes, and drives were blocked, some for several days. Rural residents often found they could not get to their places of employment, could not get to town to purchase food or obtain medical treatment. Merchants could not deliver needed fuel supplies. Farmers had a difficult time caring for livestock and found it almost impossible to load and deliver grain because of the deep snow drifts. Untold hours of labor and untold gallons of fuel were used to move snow. Properly located windbreaks or "snow trippers" could have prevented many of these problems.

In January of 1981, the Soil Conservation Service in Illinois sent questionnaires to their field offices throughout the state. The field office personnel determined the number of heated buildings not located in cities, towns, and subdivisions that could be protected from the cold winter winds by windbreaks.

Assistance was obtained from the University of Illinois Cooperative Extension Service and the Illinois Power Company in Champaign in estimating energy needs of an average home, located in various places in the state. The average home selected has 1,500 square feet, 6 inches of insulation in the attic, 4 inches in the walls and 2 inches under the floor. In estimating energy needs, the worst average outside temperatures at Moline, Springfield, and St. Louis were used. It was assumed that the temperature in the average home would be maintained at 70° F. during the heating season.

The following chart shows the estimated number of heated buildings in the state that could be protected by windbreaks, the heating energy needed per heating season and potential units of energy that could be saved if all the buildings were protected by windbreaks. A savings of 15% was assumed.

			15% Saving (annual)				
Location in State [1]	No. Buildings	Trillion BTU's Heat/Season	Billion BTU	Million KWH[2] Elec.	Million Gal. #2[2] Fuel Oil	Million Gallons[2] L.P.Gas	Million Therm.[2] Nat. Gas
North	69500	11.20	1,680	492.5	11.93	18.36	16.80
Central	36300	5.35	803	235.6	5.70	8.78	8.03
South	35800	4.86	729	213.0	5.17	7.97	7.29
TOTALS	141600	21.41	3,212	941.1	22.80	35.11	32.12

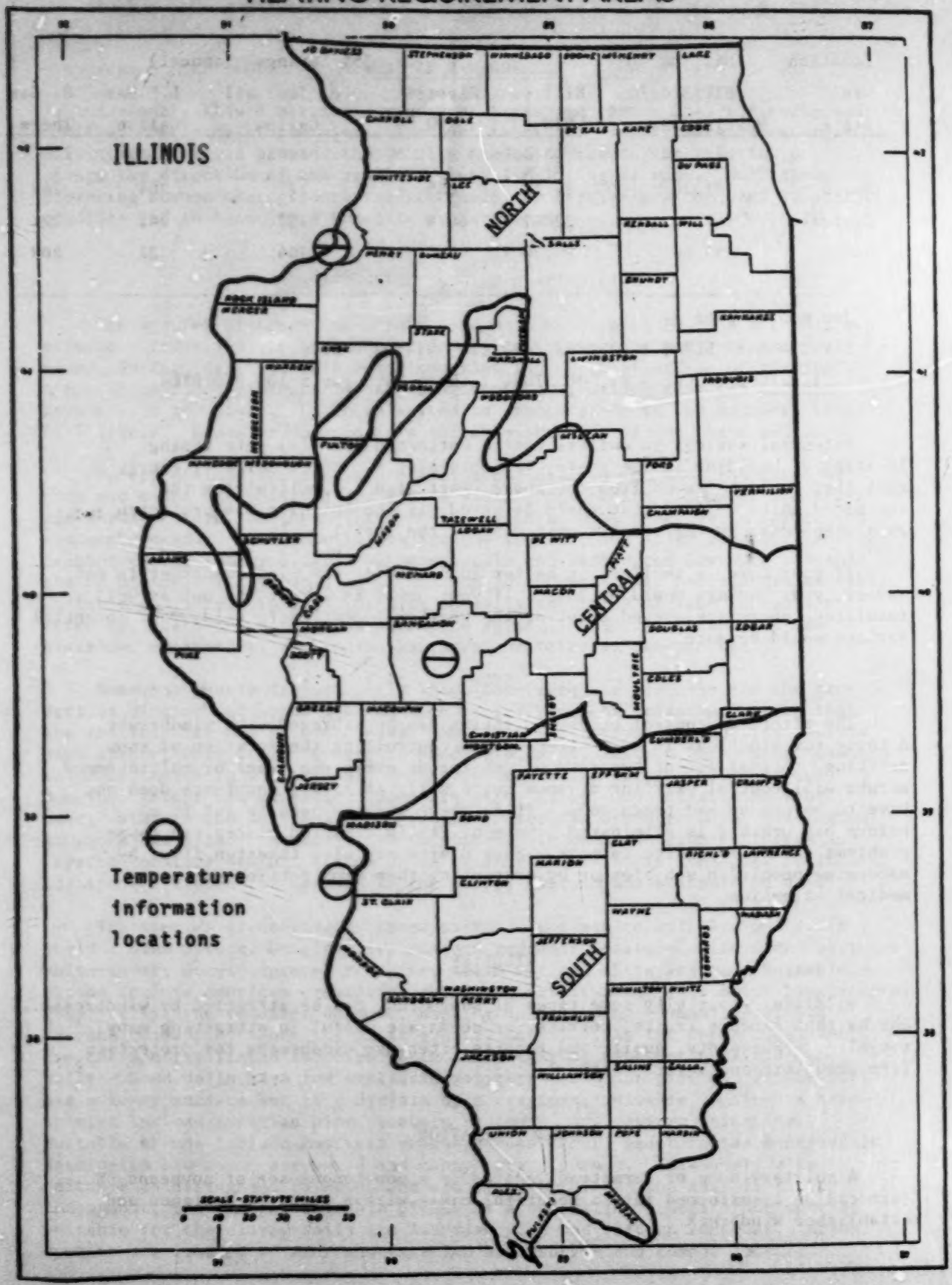
[1] See map on page 3.

[2] 1-KwH = 3413 BTUs, 1 Ga.#2 fuel oil = 141,000 BTUs, 1 gal. L.P. Gas = 91,500 BTUs, 1 therm nat. gas = 100,000 BTUs

Potential statewide savings are between 10 million and 40 million dollars depending on the type of fuel being used, the price of the fuel used and weather conditions.

The chart on page 4 shows estimated potential energy savings per heating season for the previously described home, when protected by a windbreak.

HEATING REQUIREMENT AREAS



Location in State[1]	Million BTU/Bldg/ Heating/Season	Million BTUs	Electric KWH	15% Savings (annual) #2 fuel oil Gallon	L.P.Gas Gallon	N. Gas Therm
North	161.20	24.18	7085	171	264	242
Central	147.40	22.11	6478	157	242	221
South	135.60	20.34	5960	144	222	203

[1] See map on page 3.

[2] 1-KWH = 3413 BTUs, 1 gal. #2 fuel oil = 141,000 BTUs, 1 gal. L.P. Gas = 91,500 BTUs, 1 therm nat. gas = 100,000 BTUs

Potential savings in dollars can be estimated by: (1) determining location of building in the state, (2) obtaining estimated units of energy fuel that could be saved from the above chart, and (3) multiplying the estimated units of fuel that could be saved, if the building was protected by a windbreak, by the current unit cost of the fuel.

If your home is smaller, is better insulated or the winter weather is not severe, your savings would be less. If your house is larger, is not as well insulated, doors are opened a lot or the weather is extremely cold, your potential savings would be more.

SNOW

The effective control of snow drifting can be achieved with windbreaks. A three row windbreak is very effective in controlling the location of snow drifting. Actual one or two rows of coniferous evergreen trees or multistemmed shrubs will control drifting of snow quite well. A living snowfence does not have to be put up and taken down. It is there and the need to get it up before bad weather is eliminated. Snow drifts in unwanted places can cause problems and be expensive to move. Snow drafts may also threaten lives by marooning people in vehicles or by preventing them from getting emergency medical attention.

WILDLIFE

Wildlife, especially some types of songbirds, can be attracted by windbreaks. Shrubs that produce fruits, berries, or seeds are useful in attracting many songbirds. Pheasants, quail, and rabbits often use windbreaks for protection from predators and severe weather.

BEAUTIFICATION

A solitary home or farmstead located in a monotonous sea of soybeans or corn can be transformed into a beautiful oasis with a properly designed and established windbreak.

WHAT IS A WINDBREAK

A windbreak is a barrier composed of trees and shrubs that redirects and modifies the force of the wind. The best trees for windbarriers are evergreens. Multistemmed shrubs provide the density needed to reduce the velocity or change the direction of the wind and control drifting of snow. Multistemmed flowering shrubs that produce seeds, fruits, or berries are the best to attract wildlife and to beautify a homesite or farmstead.

SPECIES SELECTION AND ADAPTABILITY

The species of trees and shrubs used must be adapted to both the soil and climate. Trees and shrubs not adapted may not survive or may grow extremely slow. Surface drainage is a very important factor in selection of species to use. Where ponding occurs for any length of time, baldcypress can be used anywhere in the state. Larch is suited to ponded sites in the northern third of Illinois. Redosier dogwood is a suitable shrub to use on these sites.

Poorly drained soils that are adequately drained for the production of corn and beans are suitable for a wide variety of species. Some of the trees are Norway spruce, northern white-cedar, eastern white pine, white spruce and eastern redcedar. Suitable shrubs include redosier and silky dogwood, American cranberrybush, amur and tatarian honeysuckle and Washington hawthorn. Should the pH of the soil exceed 7.4, in the top 20 inches, fewer species are suitable. Suitable coniferous species for high pH soils should be limited to eastern redcedar, northern white-cedar and white spruce. Suitable shrubs include blackhaw, nannyberry, Washington hawthorn and tatarian honeysuckle.

Somewhat poorly drained soils which have adequate drainage for the production of corn and beans have an even larger group of trees and shrubs that are suitable for use in windbreaks. Suitable coniferous tree species include blue spruce, Douglas-fir (where no ponding occurs), eastern white pine, eastern redcedar, northern white-cedar, Norway spruce, white fir and white spruce. Numerous shrubs are suitable. Some are gray, silky, and redosier dogwoods, amur, tatarian and whitebelle honeysuckle, American cranberrybush, Washington hawthorn and lilac. Autumn-olive is suitable in counties from Effingham and Fayette counties south. If the pH is greater than 7.4, in the upper 20 inches, the species listed for high pH in the poorly drained soils should be used.

The species of coniferous trees suitable for use on well drained soils include blue spruce, Douglas-fir, eastern redcedar, eastern white pine, northern white-cedar, Norway spruce, red pine, white fir and white spruce. Suitable shrubs include American cranberrybush, amur, tatarian and whitebelle honeysuckle, gray, silky, and redosier dogwood, Washington hawthorn, common lilac, and Sargent crabapple. When the pH is greater than 7.4, in the upper 20 inches, use the species listed for high pH in the poorly or somewhat poorly drained soils. Some soils have low available moisture for plant growth. If the soil has a loamy surface but is underlain by a fragipan, suitable coniferous tree species include Austrian pine, eastern redcedar, and eastern whitepine. Suitable shrubs include American cranberrybush, amur, and tatarian honeysuckle, Washington hawthorn, arrowwood and nannyberry viburnum. Autumn-olive is suitable in Effingham, Fayette, and counties south. If the soil is clayey throughout, the list of suitable plants is even smaller. Coniferous species suitable for the clayey soils are Austrian pine and eastern redcedar. Shrub species are limited to amur and tatarian honeysuckle and common lilac.

Coniferous species suitable for sandy soils with moderate available moisture include Austrian pine, blue spruce, Douglas-fir, eastern redcedar, eastern white pine, northern white-cedar, Norway spruce and red pine. Suitable shrubs include American cranberrybush, amur and tatarian honeysuckle, gray dogwood, Washington hawthorn and arrowwood. Autumn-olive is suitable in Effingham and Fayette counties and all counties to the south.

Species suitable for sandy soils or soils with sand, gravel, or bedrock at 20 to 40 inches of depth include Austrian pine, eastern redcedar, eastern white pine, jack pine (north of Effingham County) and red pine. Suitable shrubs include amur and tatarian honeysuckle and Washington hawthorn. Autumn-olive is suitable in Effingham and Fayette counties and all counties south.

Coniferous species suitable for deep silty soils with high available moisture and free carbonates at the surface include eastern redcedar and jackpine. Shrubs include Siberian peashrub, tatarian honeysuckle and Washington hawthorn.

Coniferous tree species for soils high in sodium is limited to eastern redcedar. Tatarian honeysuckle is a suitable shrub species.

LOCATION-DESIGN

Almost all of the severe winter storms in Illinois come from a westerly or northerly direction. Because of this primary windbreaks should be on the west and north sides of the building or area to be protected. A secondary windbreak may be placed on the east side if desired. A primary windbreak on either the north or west side is beneficial if something prevents the establishment of a windbreak on both the west and north sides. Heated buildings in areas getting snow from Lake Michigan will also benefit from windbreaks on the east side.

The design of a windbreak is very important. When designing a windbreak the purpose or purposes of establishing the windbreak must be considered. Care must also be taken so drifting of snow caused by the windbreak will not cause problems.

Where the protection of a heated building from the cold winds is the only objective, three rows of conifers or two rows of conifers and one row of shrubs on the windward is adequate. If enhancement of the area for wildlife is desired, plant two rows of conifers with a row of fruiting shrubs on either side of the two conifer rows or on the leeward side only.

If beautification is an objective, plant one or two rows of flowering shrubs on the leeward side of two rows of conifers. Rows may be straight, curved, zig-zagged or offset as desired or as best fits the area. To prevent the drifting of snow in undesired places, the windward row should be at least 100 feet from the area to be protected from drifting snow. If the windbreak site is south of Interstate-64, the windward row can be placed 65 feet from the area to be protected from drifting snow.

A snow "tripper" can be created by planting one or more rows of conifers or multistemmed shrubs 50 to 100 feet windward and parallel to the primary windbreak. Most of the snow will drift in this area. This makes it possible to plant the conifers closer to the building or area being protected from the wind, providing quicker and somewhat better protection without creating hazardous

drifting of snow. At least 40 feet should be left between a home being protected and the leeward row of trees or shrubs. This will allow for crown spread of the trees or shrubs, spread of foundation plantings and a passageway between the mature windbreak and the building.

SPACING OF ROWS

Evergreen rows should be 12 to 16 feet apart. Shrub rows should be 12 to 16 feet from the conifers. Shrub rows should be 6 to 12 feet apart. Deciduous broadleaf trees should be planted at least 25 feet from conifers or evergreens to prevent stunting or killing. Use shade tolerant shrubs where there is a potential of shading.

SPACING OF PLANTS IN ROW

The windward row of evergreens, except eastern redcedar and northern white-cedar, should be spaced 8 to 16 feet apart. The eastern redcedar should be planted 4 to 10 feet apart and the northern white-cedar 6 to 10 feet apart. The closer spacing of the windward row will give protection from wind and snow in fewer years than will a wider spacing. The interior row spacing can be wider, but should not exceed 16 feet except for eastern redcedar and northern white-cedar, which should not exceed 12 feet.

Shrubs should be spaced 3 to 6 feet apart.

Deciduous broadleaf trees should be spaced 8 to 15 feet apart.

The location, design, spacing and choice of species are very important. All steps should be carefully thought out and planned.

TREE AND SHRUB DISEASE & INSECTS

No tree or shrub is immune to diseases and insects. Fortunately most diseases and insects are selective and limit their damage to one species of tree or shrub.

This is a very good reason for planting more than one species of tree or shrub in a windbreak. If more than one species is suited to the soil and climate, plant a different species in each row. Shrub species should not be mixed in a row by planting alternate species. Plant one portion of the row to one species and another portion to a different species.

Insects such as bagworms, aphids, and red spider mites can be controlled with chemical sprays. Bagworms appear to prefer northern white-cedar and eastern redcedar but will feed on other conifers such as spruce. Douglas-fir and spruce (especially blue spruce) are alternate hosts for Cooley's spruce gall aphids. The spruce is damaged much more than the Douglas-fir. It is not serious in Illinois at this time. Corrective action can be spraying with chemicals to control the aphids or refraining from planting blue spruce and Douglas-fir within 500 feet of each other for any reason.

Blue and white spruce are also susceptible to a fungus called Rhizosphaera Needle Cast. This has been observed in southern Illinois on blue spruce. It can be controlled with a chemical spray. A relatively new pest called the pinewood nematode has been recently identified in Illinois. It attacks and kills only pine and is spread by a woodboring beetle. Sanitation (removal and disposal of dead trees by burning) is one possible way of preventing spread to other trees. The Japanese have used chemicals to control the beetles that spread the nematode from tree to tree. Presently, no chemical in the United States has been labelled for this use. In Illinois, the nematode seems to prefer Scotch pine. Other known hosts of the pinewood nematode are Austrian pine, red pine, jack pine, Virginia pine and white pine. It has been found in other pines not used for windbreaks in Illinois.

Lilac can be killed by the lilac borer. An aphid has been damaging and killing some of the bush honeysuckle, except amur, in Illinois. It can be controlled by spraying with chemicals. Autumn-olive in the northern two thirds of the state was winter-killed or severely damaged by severe winter weather during the late 1970's. Canker or a canker-like disease has damaged and killed autumn-olive from Morgan to Iroquois county.

PLANTING STOCK

Care should be taken in selecting planting stock when you can select your own. All planting stock should be in vigorous condition and free of disease, insects, and physical damage. If you cannot select your planting stock at a nursery, obtain stock produced by a reputable nursery. Windbreaks can be established with balled and burlapped, container grown, potted or bare root seedlings.

Bare root conifer seedlings should be 4 to 24 inches tall. Bare root conifer seedlings less than 8 inches and more than 18 inches in height require more care than the intermediate sizes and mortality may be greater. The diameter of the seedling at groundline should be 3/16 inches or greater. The seedlings should be dormant and have well developed buds. Bare root shrub seedlings should be 18 to 36 inches tall before pruning. Smaller or larger shrubs usually require more care than the intermediate sizes and suffer a higher rate of mortality.

Container grown seedlings are those that have been growing in a container for at least one growing season. Potted seedlings are those that have been placed in some type of pot or container and sold in a few days or weeks. Some of the container grown or potted seedlings should be carefully removed from the pot to see if the roots have been turned up or wound around the inside of the pot. If either is discovered, all plants should be removed from the containers and the roots spread out and straightened when planting. When balled and burlapped seedlings are used, be sure that the earthen ball has not been allowed to dry out or that the soil has not been separated from the roots.

CARE OF SEEDLINGS

Seedlings should be planted as soon as possible after they have been obtained or received. Bare root seedlings can be kept for a few days in the

shipping bundle if they are stored in a cool place and the roots kept moist. If they are kept longer, they should be heeled in. Container grown, potted, and balled and burlapped seedlings should also be planted within a few days after being obtained or received. If they cannot be planted in a few days, they should be stored in a cool place, the soil and roots kept moist and protected from freezing.

SITE PREPARATION

Good site preparation will result in a higher survival rate of the planted trees and shrubs, increased growth rate of the trees and shrubs and a reduction in the competition from grasses and weeds.

Several methods or a combination of methods can be used to provide good site preparation. Some are as follows:

1. Non-erosive sites -- destroy existing vegetation on the entire windbreak area by cultivation. This is most successful when done during the late summer prior to spring planting. Wet soil conditions often prevent cultivation in the spring and it is usually harder to kill existing vegetation in the spring. The natural regeneration of grasses and weeds can be reduced and delayed by seeding the area to one bushel of oats per acre by September 15.

2. Erosive and non-erosive sites -- destroy existing vegetation in strips or spots extending 2 to 3 feet in all directions from where the seedling will be planted. This should be done by cultivation in late summer. When strips are cultivated on sloping areas, they should be on the contour to prevent excessive erosion. Where contouring is not possible or desired, seed the strips to one bushel of oats per acre, by September 15, to control erosion. Wet soil conditions often prevent cultivation in the spring and it is usually harder to kill existing vegetation in the spring.

3. When planting will be in existing sod, remove sod from an area extending at least 2 feet in all directions from where the seedling will be planted. This should be done in late August or early September of the year prior to planting the seedlings.

4. Approved chemicals may be used to kill existing perennial vegetation. The application of the chemicals during September of the year prior to spring planting usually gives the best results. The chemicals should be applied so that all vegetation will be killed within 2 to 3 feet of where each seedling will be planted. Information on approved chemicals may be obtained from chemical dealers, from the County Extension Advisor's Office or the local Soil Conservation Service Office. Always apply chemicals according to instructions on the label.

Use an appropriate method for spring site preparation if the site cannot be prepared during the prior year.

Use any of the described methods when preparing site for fall planting of container grown or balled and burlapped planting stock. For the best success site preparation should be done by the last of September.

If annual or perennial grasses and weeds germinate before the seedlings are planted, additional site preparation is needed to destroy this unwanted vegetation before planting.

WHEN TO PLANT

For best results bare root and potted seedlings should be planted during the spring planting season only. Planting should start when the ground has thawed and is dry enough for the selected method of planting to be used. Planting should stop on April 25 in the southern part of the state, on May 5 in the central part of the state and on May 15 in the northern part of the state. Balled and burlapped and container grown plants should be planted during this period and may be planted during the fall planting season. The fall planting season for conifers starts September 1 and ends November 1 in the northern part of the state. It starts September 15 and ends December 1 in the central and southern parts of the state. The fall planting season for deciduous broadleaf seedlings starts when the plant under field conditions becomes dormant and ends when the soil cannot be satisfactorily worked.

PLANTING TREES AND SHRUBS

Bare root planting stock that has roots that are limp and hang down may be slot planted. This can be done by using a tree planting bar, a spade, a shovel, or a tree planting machine. Care must be taken to insure that roots are not turned up, are not wadded into a ball, and that air pockets are eliminated from around the roots.

Bare root planting stock that has stiff lateral roots needs to be planted in a hole that is large enough and deep enough to accommodate the spread out roots. The hole may be dug with a planting hoe, a post hole digger, a spade, a shovel, etc. Care must be taken when backfilling to eliminate air pockets around the roots.

Balled and burlapped and container grown planting stock should be planted in a hole that is 2 feet greater in diameter and 1 to 2 inches greater in depth than the ball or container. The planting hole needs to be larger than the ball or container to allow proper backfilling with topsoil or prepared backfill material. Prepared backfill material consists of 1 cubic yard of topsoil and 3 cubic feet of peat moss, well mixed. Remove all cords, wire, and burlap from the trunk of the plant during or near the end of the planting operation. Cover the burlap to prevent it from acting as a wick that would remove moisture from near the plant. Containers need not be removed from container grown plants if they will decompose during the first growing season. Containers may or may not need to be removed from potted plants if the container will decompose during the first growing season. Determine need to remove by cutting the bottom from several pots. If any roots are turned up, remove all plants from containers and plant same as bare root stock with stiff lateral roots.

CARING FOR AND MANAGING WINDBREAKS

Once trees and shrubs are planted, they must receive some care if good survival rate and good growth are to be achieved.

Watering is usually beneficial and often essential to the survival and growth of the planting stock during the first growing season after planting. This is especially true of planting stock that has relatively large tops when periods of low soil moisture occur.

In young windbreaks, grasses and weeds compete for moisture, nutrients and sunlight. Competition results in less vigor, slower growth and even death of trees and shrubs. Prevention of competing vegetation can be accomplished by cultivation, by using chemicals or by mulching.

Limit depth of cultivation to prevent damage to roots. Some hand hoeing will be needed to remove vegetation near the trees. Cultivate until the tree branches prevent operation of the machinery. Do not prune lower limbs or injure them with equipment.

Mulching or chemicals may be used to control vegetation within two feet of the tree or shrub. To be effective the mulch or the chemicals should be applied immediately after the seedlings have been planted. Limit depth of mulch adjacent to the tree or shrub trunk to 4 inches. Follow label directions when using chemicals. Mow untreated or nonmulched areas. Do not remove or injure lower limbs.

Protection of the windbreak from fire is essential. A small fire can destroy, in a few minutes, a windbreak that took years to establish. A firebreak should be established if there is a possibility of fire escaping and invading the windbreak.

Protection of the windbreak from livestock and poultry is also essential. Livestock can kill both young and old trees. Cattle and horses can also prune larger trees in a windbreak. This eliminates or greatly reduces the beneficial effects of the windbreak by allowing both the wind and snow to pass under the windbreak.

WINDBREAK RENOVATION

Older windbreaks, damaged windbreaks and windbreaks that have not been properly managed do not function properly and should be renovated. The renovation of these windbreaks varies from the planting of one or more rows of trees and shrubs on either or both sides of the existing windbreak to complete removal of the windbreak and replanting. The guidelines for new windbreaks apply when complete removal and replanting is needed.

An old windbreak that is losing its lower limbs can be renovated by planting one or more rows of multistemmed shrubs or coniferous trees on the windward side. They can be planted on the leeward side but may not provide as much protection as desired and will not protect the interior of the existing windbreak. The new rows of shrubs or conifers should be planted 12 to 16 feet from the overhang of existing trees to prevent stunting or killing of the seedlings.

If diseases or insects kill a row of conifers in a windbreak, the dead trees should be removed and burned, to prevent further spread of the disease or insect. If the affected row is an interior row of a windbreak composed of three or more rows of conifers, nothing else needs to be done. If the affected

row is an outside row, it should be replaced by planting seedlings. The species should be different than the original to avoid reinfestation by the disease or insect that killed the original trees. The careful selection of the species to be used, the selection and care of planting stock and the care and management after planting is just as important as it is for a new windbreak.

For additional assistance in planning and designing windbreaks contact the Soil Conservation Service personnel assisting your local soil and water conservation district.

Assistance may also be obtained from the district forester servicing your county or from your local county extension adviser.

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